

WHAT IS CLAIMED IS:

1. An exposure apparatus which has a stage for aligning a substrate surface to an imaging plane on the basis of a detection signal from a focus sensor, moves
5 the substrate by the stage, transfers a projection pattern, and exposes the substrate, comprising:
 - a controller for, when an exposure shot region on the substrate cannot converge to a predetermined precision, determining the exposure shot as an error,
10 and controlling the stage so as to move the substrate to a predetermined position upon determination of the error; and
 - an exposure unit for forcibly transferring the projection pattern onto the substrate at the
15 predetermined position in the exposure shot and exposing the substrate.
2. The apparatus according to claim 1, wherein the predetermined position includes a focus position and/or tilt position.
- 20 3. The apparatus according to claim 1, wherein when an exposure method of said exposure unit is a still method, said controller determines an error on the basis of calculation results of measurement values at a plurality of focus measurement points obtained by
25 measuring a focus in the exposure shot region with respect to the imaging plane.
4. The apparatus according to claim 1, wherein when

an exposure method of said exposure unit is a scan method, said controller determines an error on the basis of calculation results of measurement values obtained by measuring a focus or tilt for an exposure
5 shot in a region immediately before exposure.

5. The apparatus according to claim 1, wherein when said exposure unit performs forced exposure, the predetermined position includes focus and tilt target values of the stage derived from measurement results of
10 global focus measurement and global tilt measurement that are executed for the substrate in advance.

6. The apparatus according to claim 1, wherein when said exposure unit performs forced exposure, the predetermined position includes focus and tilt target
15 values concerning an exposure shot exposed normally immediately before forced exposure.

7. The apparatus according to claim 1, wherein when said exposure unit performs forced exposure, said controller causes said exposure unit to continue an
20 exposure sequence.

8. The apparatus according to claim 1, wherein said controller has an interface for causing said exposure unit to pause and/or suspend an exposure sequence and causing an operator to select and/or determine
25 subsequence processing when said exposure unit performs forced exposure.

9. The apparatus according to claim 8, wherein said

controller has an interface for causing said exposure unit to pause and/or suspend the exposure sequence and causing the operator to select and/or determine subsequence processing when said exposure unit forcedly
5 exposes a preset finite number of successive exposure shots.

10. The apparatus according to claim 8, wherein said controller has an interface for causing said exposure unit to pause and/or suspend the exposure sequence and
10 causing the operator to select and/or determine subsequence processing when said exposure unit forcedly exposes a finite number of exposure shots preset for a total number of times after said exposure unit starts a job.

15 11. The apparatus according to claim 8, wherein said controller has an interface for causing said exposure unit to pause and/or suspend the exposure sequence and causing the operator to select and/or determine subsequence processing when a number of exposure shots
20 forcedly exposed by said exposure unit exceeds a preset allowable value.

12. An exposure apparatus for transferring a projection pattern onto a substrate and exposing the substrate while scanning the substrate by a stage,
25 comprising:

a controller for, when an exposure shot region on the substrate cannot converge during scan to a

predetermined focus precision or leveling precision, a
predetermined two-dimensional sync control precision,
or a predetermined exposure amount control precision,
determining the exposure shot as an error, and
5 controlling the stage so as to move the substrate to a
predetermined position upon determination of the error;
and

an exposure unit for forcibly transferring the
projection pattern onto the substrate at the
10 predetermined position in the exposure shot and
exposing the substrate.

13. The apparatus according to claim 12, wherein the
predetermined position includes a focus position and/or
leveling position.

15 14. The apparatus according to claim 12, wherein when
said exposure unit performs forced exposure, the
predetermined position includes focus and tilt target
values derived from measurement results of global focus
measurement and global tilt measurement that are
20 executed for the substrate in advance.

15. The apparatus according to claim 12, wherein when
said exposure unit performs forced exposure, the
predetermined position includes focus and tilt target
values concerning an exposure shot exposed normally
25 immediately before forced exposure.

16. The apparatus according to claim 12, wherein when
said exposure unit performs forced exposure, said

controller causes said exposure unit to continue an exposure sequence.

17. The apparatus according to claim 12, wherein said controller has an interface for causing said exposure
5 unit to pause and/or suspend an exposure sequence and causing an operator to select and/or determine subsequence processing when said exposure unit performs forced exposure.

18. The apparatus according to claim 17, wherein said
10 controller has an interface for causing said exposure unit to pause and/or suspend the exposure sequence and causing the operator to select and/or determine subsequence processing when said exposure unit forcibly exposes a preset finite number of successive exposure
15 shots.

19. The apparatus according to claim 17, wherein said controller has an interface for pausing and/or suspending the exposure sequence and causing the operator to select and/or determine subsequence
20 processing when said exposure unit forcibly exposes a finite number of exposure shots preset for a total number of times after said exposure unit starts a job.

20. The apparatus according to claim 17, wherein said controller has an interface for causing said exposure
25 unit to pause and/or suspend the exposure sequence and causing the operator to select and/or determine subsequence processing when a number of exposure shots

forcedly exposed by said exposure unit exceeds a preset allowable value.

21. An exposure apparatus for transferring a projection pattern onto a substrate and exposing the substrate while scanning the substrate, comprising:

5 a controller for, when an exposure shot region cannot converge to a predetermined focus precision during scan, determining the exposure shot as an error, and controlling a shot beam from an exposure light source upon determination of the error.

22. The apparatus according to claim 21, wherein said controller shields the shot beam from the exposure light source or stops an emission command upon determination of the error.

15 23. The apparatus according to claim 22, wherein shielding of the shot beam or stop of the emission command by said controller is executed upon determination of the error by said controller before an exposure slit enters an exposure area.

20 24. The apparatus according to claim 22, wherein said controller has an interface for pausing and/or suspending an exposure sequence and causing an operator to select and/or determine subsequent processing when the shot beam is shielded or the emission command is stopped.

25 25. The apparatus according to claim 22, wherein said controller retries exposure under the same condition

when the shot beam is shielded or the emission command is stopped.

26. The apparatus according to claim 25, further comprises a stage for moving the substrate to a
5 predetermined position upon determination of the error, and an exposure unit for forcibly transferring the projection pattern onto the substrate and exposing the substrate at the predetermined position in the exposure shot, and

10 said exposure unit executes forced exposure when a focusing error of the exposure light source is determined.

27. The apparatus according to claim 26, wherein when an exposure slit of said exposure unit has already
15 entered an exposure area, said controller causes said exposure unit to complete exposure without shielding the shot beam or stopping the emission command even upon determination of the error.

28. The apparatus according to claim 26, wherein said
20 controller automatically selects upon determination of the error whether said exposure unit retries exposure and/or executes forced exposure, and causes said exposure unit to execute an exposure sequence without pausing and/or suspending the exposure sequence.

25 29. The apparatus according to claim 26, wherein said controller has an interface for causing said exposure unit to pause and/or suspend an exposure sequence and

causing the operator to select and/or determine
subsequence processing when said exposure unit forcibly
exposes a preset finite number of successive exposure
shots.

5 30. The apparatus according to claim 26, wherein said
controller outputs to said exposure unit one of a
command for retrying exposure, a command for executing
forced exposure, and a command for completing exposure
without shielding the shot beam or stopping the
10 emission command even upon determination of the error.

31. The apparatus according to claim 21, wherein said
controller determines an error when a current focus
measurement value in the exposure shot exceeds a focus
or tilt amount set as a threshold for error
15 determination with respect to a previous measurement
value.

32. The apparatus according to claim 31, further
comprising a memory for storing an exposure shot
position upon determination of the error for each
20 substrate.

33. The apparatus according to claim 32, wherein said
controller identifies generation of contamination of a
wafer chuck on the basis of positional information of
the exposure shot stored for each substrate.

25 34. The apparatus according to claim 33, wherein said
controller pauses and/or suspends an exposure sequence
by an exposure unit when contamination of the wafer

chuck is identified.

35. The apparatus according to claim 34, wherein said controller has an interface for issuing a warning to an operator when contamination of the wafer chuck is

5 identified.

36. A semiconductor device manufacturing method comprising the steps of:

installing manufacturing apparatuses for various processes including the exposure apparatus which has a
10 stage for aligning a substrate surface to an imaging plane on the basis of a detection signal from a focus sensor, moves the substrate by the stage, transfers a projection pattern, and exposes the substrate, a controller for, when an exposure shot region on the
15 substrate cannot converge to a predetermined precision, determining the exposure shot as an error, and controlling the stage so as to move the substrate to a predetermined position upon determination of the error; and an exposure unit for forcibly transferring the
20 projection pattern onto the substrate at the predetermined position in the exposure shot and exposing the substrate, in a semiconductor manufacturing factory; and

manufacturing a semiconductor device by using the
25 manufacturing apparatuses in a plurality of processes.

37. The method according to claim 36, further comprising the steps of:

connecting the manufacturing apparatuses by a
local area network; and

communicating information about at least one of
the manufacturing apparatuses between the local area
5 network and an external network outside the
semiconductor manufacturing factory.

38. The method according to claim 37, wherein a
database provided by a vendor or user of the exposure
apparatus is accessed via the external network to
10 obtain maintenance information of the manufacturing
apparatus by data communication, or production
management is performed by data communication between
the semiconductor manufacturing factory and another
semiconductor manufacturing factory via the external
15 network.

39. A semiconductor manufacturing factory comprising:
manufacturing apparatuses for various processes
including the exposure apparatus which has a stage for
aligning a substrate surface to an imaging plane on the
20 basis of a detection signal from a focus sensor, moves
the substrate by the stage, transfers a projection
pattern, and exposes the substrate, a controller for,
when an exposure shot region on the substrate cannot
converge to a predetermined precision, determining the
25 exposure shot as an error, and controlling the stage so
as to move the substrate to a predetermined position
upon determination of the error; and an exposure unit

for forcibly transferring the projection pattern onto the substrate at the predetermined position in the exposure shot and exposing the substrate;

a local area network for connecting said
5 manufacturing apparatuses; and

a gateway which allows the local area network to access an external network outside the factory,

wherein information about at least one of said manufacturing apparatuses can be communicated.

10 40. A maintenance method for the exposure apparatus which has a stage for aligning a substrate surface to an imaging plane on the basis of a detection signal from a focus sensor, moves the substrate by the stage, transfers a projection pattern, and exposes the
15 substrate, a controller for, when an exposure shot region on the substrate cannot converge to a predetermined precision, determining the exposure shot as an error, and controlling the stage so as to move the substrate to a predetermined position upon
20 determination of the error; and an exposure unit for forcibly transferring the projection pattern onto the substrate at the predetermined position in the exposure shot and exposing the substrate, and that is installed in a semiconductor manufacturing factory, comprising
25 the steps of:

causing a vendor or user of the exposure apparatus to provide a maintenance database connected

to an external network of the semiconductor
manufacturing factory;

authorizing access from the semiconductor
manufacturing factory to the maintenance database via
5 the external network; and

transmitting maintenance information accumulated
in the maintenance database to the semiconductor
manufacturing factory via the external network.

41. The apparatus according to claim 1, further
10 comprising a display, a network interface, and a
computer for executing network software, and

maintenance information of the exposure apparatus
can be communicated via the computer network.

42. The apparatus according to claim 41, wherein the
15 network software is connected to an external network of
a factory where the exposure apparatus is installed,
provides on said display a user interface for accessing
a maintenance database provided by a vendor or user of
the exposure apparatus, and enables obtaining
20 information from the database via the external network.